CLAIMS

1. A charge pumping system capable of a forward operation mode and a reverse operation mode, wherein in forward operation mode the charge pumping system can step-up an input voltage at a ratio of ½:1 and can step-down the input voltage at a ratio of at least one of 1:1, 3:2, 2:1 and 3:1, and wherein in reverse operation mode the charge pumping system can step-down the input voltage at a ratio of 1:½ and 1:1 and can step-up the input voltage at a ratio of at least one of 2:3, 1:2 and 1:3.

2. The system of claim 1 comprising:

a first node operable to be connected as either an input node or an output node for the system; and

a second node operable to be connected as either an input node or an output node for the system.

3. The system of claim 1 comprising a switching component operable to be configured to set the ratio for step-up or step-down for the forward and reverse operation modes.

4. The system of claim 3 wherein the switching component comprises a fractional switch having a plurality of segments.

5. The system of claim 4 further comprising a control circuitry for turning on one or more segments of the fractional switch.

6. The system of claim 5 wherein the control circuitry implements a PFM technique to turn on the segments.

7. The system of claim 1 wherein the system is implemented in a single monolithic semiconductor die.

8. A charge pumping system capable of a forward operation mode and a reverse operation mode, the system comprising:

a first node operable to be connected as an input node in the forward operation mode and as an output node in the reverse operation mode;

a second node operable to be connected as an input node in the reverse operation mode and as an input node in the forward operation mode;

wherein in forward operation mode the charge pumping system can step-up an input voltage at a ratio of ½:1 and can step-down the input voltage at a ratio of at least one of 1:1, 3:2, 2:1 and 3:1, and wherein in reverse operation mode the charge pumping system can step-down the input voltage at a ratio of 1:½ and 1:1 and can step-up the input voltage at a ratio of at least one of 2:3, 1:2 and 1:3; and

a switching component connected to the first node and the second node, the switching component operable to be configured to set the ratio for step-up or step-down for the forward and reverse operation modes, the switching component comprising at least one fractional switch having a plurality of segments.

9. The system of claim 8 further comprising a control circuitry for turning on one or more segments of the fractional switch.

10. The system of claim 9 wherein the control circuitry implements a PFM technique to turn on the segments.

11. The system of claim 8 wherein the system is implemented in a single monolithic semiconductor die.